

### Nitro-polycyclic aromatic hydrocarbons - Crystalline nitro-PAHs

Code	Material	Purity
BCR-305	1-NitroPyrene (10 mg)	0.9976 ± 0.0007
BCR-306	1-Nitronaphthalene (10 mg)	0.996 ± 0.0010
BCR-307	2-Nitronaphthalene (10 mg)	0.9977 ± 0.0009 / -0.0011
BCR-308	9-NitroAnthracene (10 mg)	0.9975 ± 0.0010
BCR-309	6-Nitrochrysene (10 mg)	0.989 ± 0.004
BCR-310	3-NitroFlouranthene (10 mg)	0.9968 ± 0.0012 / -0.0021
BCR-311	6-NitroBenzo[a]pyrene (10 mg)	0.9978 ± 0.0008 / -0.0010
BCR-312	2-Nitro-7-methoxynaphtho[2,1-b]furan (10 mg)	0.9984 ± 0.0007

### Oxygenated polycyclic aromatic hydrocarbons - Crystalline oxygenated PAHs

Code	Material	Purity
BCR-337	Dibenzo[b,d]furan (10 mg)	0.987 ± 0.007
BCR-338	4H-Cyclopenta[def]phenanthren-4-one (10 mg)	0.9951 ± 0.0030
BCR-340	Benzo[b]naphtho[1,2-d]furan (10 mg)	0.997 ± 0.003 / -0.005
BCR-341	Benzo[b]naphtho[2,1-d]furan (10 mg)	0.996 ± 0.004 / -0.005
BCR-342	Benzo[a]fluorenone (10 mg)	0.9979 ± 0.0021 / -0.0022

### Oxygenated polycyclic aromatic hydrocarbons

#### ERM-AC213: PAHs in Toluene

	Mass fraction, (µg/g)
Benzo[a]anthracene	3.09 ± 0.04
Chrysene	3.06 ± 0.05
5-methylchrysene	3.08 ± 0.07
Benzo[b]fluoranthene	3.05 ± 0.05
Benzo[k]fluoranthene	3.06 ± 0.08
Benzo[j]fluoranthene	3.05 ± 0.10
Benzo[a]pyrene	2.86 ± 0.07
Indeno[1,2,3-cd]pyrene	3.04 ± 0.05
Dibenzo[a,h]anthracene	2.76 ± 0.05
Benzo[ghi]perylene	3.07 ± 0.05
Dibenzo[a,l]pyrene	2.85 ± 0.10
Dibenzo[a,e]pyrene	2.97 ± 0.10

### How to order reference materials

#### From JRC in Geel

Tel.: +32 14 571 705 • Fax: +32 14 590 406  
<https://ec.europa.eu/jrc/en/reference-materials>  
 E-mail: [jrc-imm-rm-distribution@ec.europa.eu](mailto:jrc-imm-rm-distribution@ec.europa.eu)

#### From authorised distributors

**LGC Standards GmbH (DE)**  
<http://www.lgcstandards.com/>  
 E-mail: [de@lgcstandards.com](mailto:de@lgcstandards.com)

**Sigma-Aldrich Chemie GmbH (CH)**  
<http://www.sigmaaldrich.com/irmm>  
 E-mail: [flukatec@sial.com](mailto:flukatec@sial.com)

**Sigma-Aldrich RTC Inc. (USA)**  
<http://www.RT-Corp.com>  
 E-mail: [RTCSalesgroup@sial.com](mailto:RTCSalesgroup@sial.com)

**ARMI (USA)**  
<http://www.armi.com>  
 E-mail: [Info@ARMi.com](mailto:Info@ARMi.com)

**Industrial Analytical (RSA)**  
<http://www.industrialanalytical.co.za>  
 E-mail: [info@industrialanalytical.co.za](mailto:info@industrialanalytical.co.za)



## Joint Research Centre Certified reference materials for pure PAHs, PCBs and dioxins

### Polychlorinated biphenyls (PCBs) BCR-365, PCBs in iso-octane

Congener	Mass fraction [mg/kg]
2,4' - Dichlorobiphenyl (PCB-8)	11.4 ± 0.4
2,3,3' - Trichlorobiphenyl (PCB-20)	15.2 ± 0.9
2,4,4' - Trichlorobiphenyl (PCB-28)	24.8 ± 1.1
3,3',4'-Trichlorobiphenyl (PCB-35)	14.3 ± 0.8
2,2',5,5' - Tetrachlorobiphenyl (PCB-52)	14.8 ± 0.6
2,2',4,5,5'-Pentachlorobiphenyl (PCB-101)	14.4 ± 0.6
2,3',4,4',5'-Pentachlorobiphenyl (PCB-118)	14.9 ± 0.8
2,2',3,4,4',5' - Hexachlorobiphenyl (PCB-138)	8.6 ± 0.6
2,2',4,4',5,5' - Hexachlorobiphenyl (PCB-153)	14.2 ± 0.6
2,2',3,4,4',5,5' - Heptachlorobiphenyl (PCB-180)	15.2 ± 0.6

### Polychlorinated biphenyls (PCBs) - Crystalline PCBs

Code	Material	Purity
BCR-289	2,4' - Dichlorobiphenyl (PCB-8) (25 mg)	0.9963 ± 0.005/-0.0018
BCR-290	2,3,3' - Trichlorobiphenyl (PCB-20) (25 mg)	0.9985 ± 0.0013
BCR-291	2,4,4' - Trichlorobiphenyl (PCB-28) (25 mg)	0.9979 ± 0.0013
BCR-293	2,2',5,5' - Tetrachlorobiphenyl (PCB-52) (25 mg)	0.9959 ± 0.0025
BCR-296	2,2',3,4,4',5' - Hexachlorobiphenyl (PCB-138) (25 mg)	0.9992 ± 0.0007
BCR-297	2,2',4,4',5,5' - Hexachlorobiphenyl (PCB-153) (25 mg)	0.9994 ± 0.0009 / -0.0005
BCR-298	2,2',3,4,4',5,5' - Heptachlorobiphenyl (PCB-180) (25 mg)	0.9957 ± 0.0014

### Confidence in measurements

All certificates and detailed production information can be found at <https://crm.irmm.jrc.ec.europa.eu>

Polychlorinated dibenzodioxins and –furans (PCDDs and PCDFs)

BCR-614 Solutions S1-S7 contain about 1 mL solution and BCR-614 Solution S8 about 0.5 mL. The solutions are available individually or as a set. A set consists of 11 ampoules, one of S2, S4-S8 and two of S1 and S3. In addition, the set contains an additional solution S9, which is not certified. This solution is intended as complementary tool for QA/QC purposes.

Expanded uncertainties typically are between 0.5 to 2 %. Indicative values for the volume fractions are given.

	S0 (mg/kg)	S1 (mg/kg)	S2 (mg/kg)	S3 (mg/kg)	S4 (mg/kg)	S5 (mg/kg)	S6 (mg/kg)	S7 (mg/kg)	S8 (mg/kg)
unlabelled compounds									
2,3,7,8-T <sub>4</sub> CDD	0.137	0.273	1.09	5.47	27.3	109			
1,2,3,7,8-P <sub>5</sub> CDD	0.698	1.394	5.57	27.9	139.3	5571			
1,2,3,4,7,8- <i>HCDD</i>	0.688	1.37	5.49	27.5	137	5497			
1,2,3,6,7,8- <i>HCDD</i>	0.696	1.391	5.56	27.81	139.1	556			
1,2,3,7,8,9- <i>HCDD</i>	0.705	1.408	5.63	28.17	140.8	563			
1,2,3,4,6,7,8- <i>HCDD</i>	1.4	2.8	11.18	55.9	280	11186			
1,2,3,4,6,7,8,9-O <sub>8</sub> CDD	1.396	2.787	11.15	55.74	278.7	1115			
2,3,7,8-T <sub>4</sub> CDF	0.139 7	0.279 0	1.116	5.58	27.89	1116			
1,2,3,7,8-P <sub>5</sub> CDF	0.707	1.412	5.65	28.2	141.2	565			
2,3,4,7,8-P <sub>5</sub> CDF	0.698	1.395	5.58	27.9	139.5	558			
1,2,3,4,7,8- <i>HCDF</i>	0.7	1.398	5.59	27.96	139.8	559			
1,2,3,6,7,8- <i>HCDF</i>	0.698	1.393	5.57	27.87	139.3	557			
1,2,3,7,8,9- <i>HCDF</i>	0.699	1.397	5.59	27.9	139.6	559			
2,3,4,6,7,8- <i>HCDF</i>	0.694	1.387	5.55	27.73	138.7	555			
1,2,3,4,6,7,8- <i>HCDF</i>	1.396	2.787	11.15	55.74	278.7	1115			
1,2,3,4,7,8,9- <i>HCDF</i>	1.394	2.78	11.14	55.7	278	11144			
1,2,3,4,6,7,8,9-O <sub>8</sub> CDF	1.397	2.79	11.16	55.8	279	11169			
<sup>13</sup> C labelled compounds									
<sup>13</sup> C-2,3,7,8-T <sub>4</sub> CDD	13.95	13.95	13.95	13.95	13.95	13.95		139.5	
<sup>13</sup> C-1,2,3,7,8-P <sub>5</sub> CDD	13.9	13.9	13.9	13.9	13.99	13.9		139	
<sup>13</sup> C-1,2,3,4,7,8- <i>HCDD</i>	13.98	13.98	13.98	13.98	13.98	13.98		139.8	
<sup>13</sup> C-1,2,3,6,7,8- <i>HCDD</i>	13.94	13.93	13.93	13.93	13.93	13.93		139.3	
<sup>13</sup> C-1,2,3,7,8,9- <i>HCDD</i>	13.95	13.94	13.94	13.95	13.94	13.95			558
<sup>13</sup> C-1,2,3,4,6,7,8- <i>HCDD</i>	27.9	27.9	27.9	27.9	27.9	27.9		279	
<sup>13</sup> C-1,2,3,4,6,7,8,9-O <sub>8</sub> CDD	27.87	27.86	27.86	27.87	27.86	27.86		278.7	
<sup>13</sup> C-2,3,7,8-T <sub>4</sub> CDF	13.96	13.96	13.96	13.96	13.96	13.96		139.5	
<sup>13</sup> C-1,2,3,7,8-P <sub>5</sub> CDF	13.94	13.93	13.93	13.93	13.93	13.93	139.3		
<sup>13</sup> C-2,3,4,7,8-P <sub>5</sub> CDF	13.95	13.94	13.94	13.94	13.94	13.94		139.2	
<sup>13</sup> C-1,2,3,4,7,8- <i>HCDF</i>	13.9	13.89	13.89	13.9	13.89	13.89		138.9	
<sup>13</sup> C-1,2,3,6,7,8- <i>HCDF</i>	13.93	13.93	13.93	13.93	13.93	13.93		139.4	
<sup>13</sup> C-1,2,3,7,8,9- <i>HCDF</i>	13.93	13.92	13.93	13.93	13.92	13.93	139.4		
<sup>13</sup> C-2,3,4,6,7,8- <i>HCDF</i>	13.93	13.93	13.93	13.93	13.93	13.93		139.4	
<sup>13</sup> C-1,2,3,4,6,7,8- <i>HCDF</i>	27.92	27.9	27.9	27.91	27.9	27.9		278.7	
<sup>13</sup> C-1,2,3,4,7,8,9- <i>HCDF</i>	27.87	27.86	27.86	27.87	27.86	27.86	278.7		
<sup>13</sup> C-1,2,3,4,6,7,8,9-O <sub>8</sub> CDF	27.88	27.87	27.87	27.88	27.87	27.87		278.7	
<sup>13</sup> C-1,2,3,4-T <sub>4</sub> CDD	13.94	13.93	13.93	13.93	13.93	13.93			557.4

Polycyclic aromatic hydrocarbons (PAHs) - Crystalline PAHs

Code	Material	Purity
BCR-046	Benzo[b]chrysene (100 mg)	0.994 + 0.006 / -0.008
BCR-047	Benzo[b]fluoranthene (100 mg)	0.997 4 ± 0.0026
BCR-048R	Benzo[k]fluoranthene (unit size 10 mg)	0.997 + 0.003 / -0.004
BCR-049	Benzo[l]fluoranthene (100 mg)	0.997 + 0.003 /-0.006
BCR-050	Benzo[e]pyrene (100 mg)	0.991 + 0.009 /-0.010
BCR-052	Benzo[ghi]perylene (100 mg)	0.9923 ± 0.0021
BCR-077R	1-Methylchrysene (unit size 10 mg)	0.991 ± 0.007
BCR-078R	2-Methylchrysene (unit size 10 mg)	0.993 ± 0.005
BCR-079R	3-Methylchrysene (unit size 10 mg)	0.993 ± 0.005
BCR-080R	4-Methylchrysene (unit size 10 mg)	0.994 ± 0.004
BCR-081R	5-Methylchrysene (unit size 10 mg)	0.9973 ± 0.0013
BCR-082R	6-Methylchrysene (unit size 10 mg)	0.9982 + 0.0013
BCR-091	Anthanthrene (100 mg)	0.996 ± 0.004
BCR-092	10-Azabenz[a]pyrene (100 mg)	0.996 ± 0.006
BCR-093R	1-Methylbenz[a]anthracene (unit size 10 mg)	0.996 ± 0.005
BCR-094	Dibenz[a,c]anthracene (100 mg)	0.996 ± 0.004
BCR-095	Dibenz[a,j]anthracene (100 mg)	0.9978 ± 0.0025
BCR-096	DiBenzo[a,l]pyrene (100 mg)	0.9972 ± 0.0025
BCR-097	Benzo[a]fluoranthene (100 mg)	0.996 ± 0.004
BCR-133	DiBenzo[a,e]pyrene (100 mg)	0.996 + 0.004 / -0.005
BCR-134	Benzo[c]phenanthrene (100 mg)	0.9968 ± 0.0014
BCR-136R	Benzo[b]naphtho[2,3-d]thiophene (unit size 10 mg)	0.994 ± 0.006
BCR-137R	Benzo[b]naphtho[1,2-d]thiophene (unit size 10 mg)	0.9966 ± 0.0029
BCR-138	Dibenz[a,h]anthracene (100 mg)	0.990 ± 0.007
BCR-139	Benzo[ghi]fluoranthene (100 mg)	0.995 ± 0.004
BCR-140	Benzo[c]chrysene (100 mg)	0.996 + 0.004 / -0.005
BCR-153R	Dibenz[a,h]acridine (unit size 10 mg)	0.9992 ± 0.0006
BCR-152	Dibenz[a,l]acridine (20 mg)	0.9985 + 0.0010 / -0.0008
BCR-154	Dibenz[a,j]acridine (100 mg)	0.9990 + 0.0007 / -0.0010
BCR-155	Dibenz[a,c]acridine (100 mg)	0.9991 + 0.0007 / -0.0008
BCR-156R	Dibenz[c,h]acridine (unit size 10 mg)	0.9936 ± 0.0021
BCR-157	Benzo[a]acridine (100 mg)	0.9982 ± 0.0018
BCR-158	Benzo[c]acridine (100 mg)	0.9987 + 0.0013 / -0.0018
BCR-159	Dibenzo[a,h]pyrene (100 mg)	0.9928 ± 0.007
BCR-160R	Flouranthene (unit size 10 mg)	0.996 + 0.004 /-0.005
BCR-168	Picene (unit size 10 mg)	0.998 + 0.001 3 /-0.004
BCR-177R	Pyrene (unit size 10 mg)	0.9980 ± 0.0004
BCR-265	Dibenzo[a,e]fluoranthene (20 mg)	0.9985 + 0.0016 / -0.0010
BCR-266	7H-Dibenzo[c,g]carbazole(20 mg)	0.9971 ± 0.0016
BCR-267	Indeno[1,2,3-cd]fluoranthene (20 mg)	0.9986 + 0.000 9 / -0.0008
BCR-269	Chrysene(20 mg)	0.9928 ± 0.0028
BCR-270	Triphenylene (20 mg)	0.9984 + 0.0010 / -0.0006
BCR-271	Benzo[a]anthracene (20 mg)	0.9984 ± 0.0009
BCR-272	Coronene (20 mg)	0.9989 + 0.0006 / -0.0004